System Operator Reports
September 2015

Contents

SYSTEM OPERATOR

TRANSPOWER

Keeping the energy flowing

System Operator Operational and System Performance Report to the Electricity Authority for September 2015

Purpose of Report

This report summarises Transpower's review of its performance as system operator for September 2015, as required under clause 3.14 of the Electricity Industry Participation Code 2010 (the Code).

Any relevant operational issues are also provided for the information of the Electricity Authority (Authority). A separate detailed System Performance report will be provided to Authority staff.

1. Business Plan Progress Update

The System Operator Business Plan outlines the key business initiatives to be undertaken in the 2015/16 financial year to enable us to meet the strategic goals set out in the System Operator Strategic Plan 2015-2020.

There are eight key business initiatives, each pertaining to one or more strategic goals, with a number of associated key performance indicators (KPIs). Performance to date is very good with over 90% of the measurable 2015/16 KPI's forecast to be on track – 1 KPI is presently not being measured due to insufficient information. Performance on each key business initiative is summarised in Appendix A.

2. September Summary from an Operational and System Performance Perspective

Operational and System Performance

While operation of the power system was largely uneventful during September, some matters of significance to operation of the power system occurred.

Contact Energy's Otahuhu CCGT (known as OTC in the co-ordination centre and Otahuhu B elsewhere) bowed out at midnight on 21 September, while there Stratford CCGT came back into service earlier in the day after a prolonged absence from the market. The departure of the Otahuhu CCGT, combined with the forthcoming decommissioning of Southdown generators on 1 January 2016, has prompted the system operator to undertake a review of system impacts and security. The first results of the review were published at the end of September.

On 20 September the system operator implemented an important upgrade to its market system. The changes will enable system co-ordinators to utilise HVDC control capabilities – roundpower and frequency keeping control (FKC) – in a more automated manner than when roundpower and FKC were first trialled in 2014, reducing the requirement for manual actions. While the capability of the HVDC controls has not been altered, the automation introduced enables roundpower and FKC operations in a wider number of circumstances. The end result will be greater operational security (fewer breaches from manual error) and market efficiency (increased FKC and roundpower operations will augment frequency keeping and reserve sharing benefits already being realised from use of HVDC capabilities).

There were two loss of supply events during September. The first, on 20 September, resulted in a loss of supply for 69 minutes at Te Awamutu substation, as Karapiro – Te Awamutu circuit 1 tripped. The second, on 29 September, was as a result of Wiri supply transformers T1 and T2 both tripping during planned switching at Otahuhu substation. This resulted in a loss of 62MW for approximately 10 minutes.

Transpower's first major drone incident occurred during September, when a drone became lodged in a Roxburgh-Islington 220kV circuit near Waimate. The drone was removed without depowering the circuit.

3. Market

There were no market systems outages exceeding two hours in duration in September.

4. Business Performance

Policy Statement Review

The system operator is currently reviewing its Policy Statement, as per its Code obligations (also key business initiative 1). The industry consultation paper and amended Policy Statement will be published in mid-October, with the system operator on target to provide a draft for consultation to the Authority in November/December 2015.

Significant Project Update – Reserves and Frequency Management Programme

The Reserves and Frequency Management (RFM) programme continued to progress per the schedule agreed between the system operator and the Authority. A RFM engagement group meeting was held. The RFM programme forms part of key business initiative 4.

Programme component projects are progressing at different stages as follows:

- Inter-island Instantaneous Reserve Sharing Implementation – The functionality to enable interim SIR sharing was deployed on 10 September as part of the Security Tools project deployment. A CAN was sent to inform industry that interim SIR sharing commenced on 29 September. The project was moved into close out phase.
- Normal Frequency Management Strategy (TASC SOW 049) – Reports were finalised and Authority feedback incorporated, with TASC SOW 049 expected to close out in early October. Further work in this area is expected, with a draft TASC SOW 55 received and presently being worked on.
- National Market for Frequency Keeping – Work is on hold pending the outcomes of TASC SOW 049 and any further TASC work in this area.
- National Market for Instantaneous Reserve – Solution requirements workshops continued. Finer points of the project's scope were, and continue to be, worked through with system operator subject matter experts and the Authority. At present the project is approximately four weeks behind schedule. However, this is not expected to impact high level design work, which will start on known and completed areas of the project while remaining requirements are finalised. Project phase completion (Delivery Business Case) remains on target for February 2016.
- RMT Study Tool – The delivery business case for this project was signed off. Work commenced with the supplier developing detailed design and functional requirements in cooperation with Transpower.
- Security Tool Implementation for New HVDC Controls – The Security Tools Project was commissioned successfully on 10 September.

Significant Project Update – Efficient Procurement of Extended Reserves Implementation

The first set of industry workshops were completed and positive feedback received. Work commenced for the next set of workshops where the system operator will focus on testing requirements. A decision was made to extend the data request, in light of industry feedback, resulting in a month's delay to the project.

Significant Project Update – PRISM

Transpower Board approval was obtained for a new commissioning date and budget. User acceptance testing (UAT) is due to commence on 12 October 2015 with a revised commissioning date of 18 March 2016. A formal request associated with this change will be raised with the Authority in October. Alstom are working have a target to resolve all critical defects in readiness for UAT commencement. Daily technical meetings and fortnightly Executive sessions ensured communication channels continued effectively.

Significant Project Update – Project Aardwolf

Project Aardwolf analysis to identify the capital expenditure to determine, inter alia, the relative merits of a new market system versus maintaining the existing market system service was completed and final sign-off obtained. The project closed and has been a crucial input to the achievement of key business initiative 5.

5. Security of Supply Update

Storage declined during the month. This is normal (and expected) as, typically, demand is high and inflows are low during this time of year. It is expected lake levels will increase in coming months as weather gets warmer and snow melt influences inflows.

NZ aggregate storage levels are 100% of average for this time of year. The hydro risk meter is currently set at "normal". In the unlikely event of significant equipment failure, the security of supply status could change quickly.

6. Compliance Report

There were no breaches of the principal performance obligations during September.

Two breaches of the Code were reported, relating to:

- incorrect modelling of a load profile; and
- an incorrect input to the final pricing information.

7. Ancillary Services

The system operator commenced its annual tender for the procurement of ancillary services on 18 September. Tender responses were invited for provision of instantaneous reserve, multiple frequency keeping, back-up single frequency keeping and over frequency reserve and North Island black start, with contracts to commence from 1 December 2015. The final date for tender submission is 16 October.

Ancillary Service Costs

The costs of ancillary services for the month are in Appendix B.

8. Code 7.10: Separation of Transpower Roles

In performing its role as system operator, Transpower has not been materially affected by any other role or capacity Transpower has under the Code or under any agreement.

Appendix A – Business Planning Update KPI Table

Key Business Initiative	# of KPIs	Complete	On track	At risk	NA	Missed	Comments
1. Assisting the Authority to meet its competition, reliability and efficiency objective (the CRE objective)	2	-	2	-	-	-	Work has commenced on both KPIs with both presently on track.
2. Developing an efficient balance between risk, reliability and resilience	3	-	3	-	-	-	Work has commenced on all KPIs with all presently on track.
3. Seeking opportunities to add value through the provision of information to support an efficient market	3	-	2	-	1	-	Work has commenced on two KPIs with both of these on track. The third KPI, relating to publishing event reports within four weeks, is currently NA as there have been no events to report against in 2015/16 to date.
4. Improvements to deliver a system operator service that meets or exceeds expectations and represents value for money	6	-	6	-	-	-	Work has now commenced on all six KPIs. All KPIs are presently on track. Two capital projects were commissioned during September, which means there is now sufficient data to rate the two project-related metrics.
5. A transparent business and requirements roadmap for investments required to deliver the system operator service	2	1	1	-	-	-	One KPI, related to aligning our capital investments, is now complete following the completion of project Aardwolf. Completion was ahead of schedule. The second KPI remains on track.
6. Building capability, and promoting a professional, responsive service culture	5	1	3	1	-	-	One KPI, relating to implementing a study version of vSPD for analyst use, has been completed ahead of schedule. Work has commenced on the remaining four KPIs, with one of these, regarding delivering on engagement plans, presently at risk.

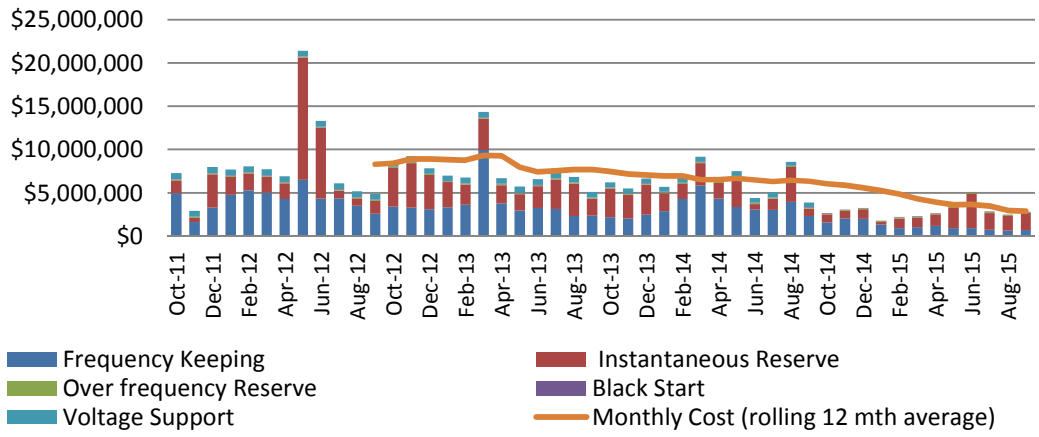
Key Business Initiative	# of KPIs	Complete	On track	At risk	NA	Missed	Comments
7. Engaging with and understanding the Authority, market participants and consumers	5	1	4	-	-	-	One KPI, relating to the completion of a 'building connections' customer video, has now been completed ahead of schedule. Work has commenced the remaining four KPIs with all presently on track.
8. Maximising opportunities arising from being part of the wider Transpower business	12	3	8	1	-	-	Three KPIs, relating to an MOU for generator commissioning, a baseline for comparing future staff turnover, and an engineering progression programme, have been completed ahead of, or on, schedule. One KPI, related to the development of a common fatigue management policy, has no longer been missed but remains at risk, following an internally agreed change to the completion date. Work has commenced, or is shortly planned to commence, on all other KPIs, with all presently on track.
Totals	**38**	**6**	**29**	**2**	**1**	**0**	

Appendix B – Ancillary Service Costs for September 2015

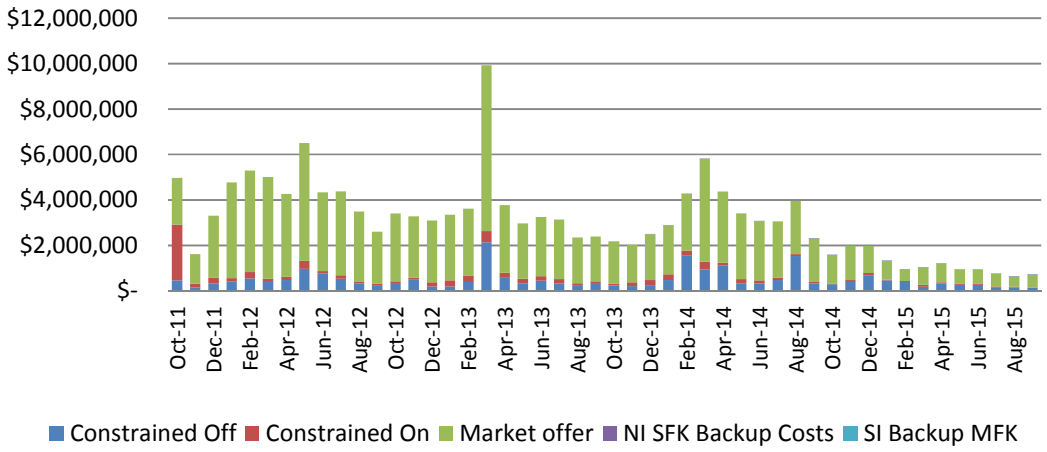
Note: The scale for the Instantaneous Reserve (Past 4 Years) graph has been reduced to clarify detail. Two months data, May and June 2012, overly influenced the graph scale.

		Cost
Frequency Keeping	Constrained Off	$128,414
	Constrained On	$22,791
	Market offer	$553,245
	NI SFK Backup Costs	$2,716
	SI Backup MFK	$2,232
	Total monthly Cost	**$709,399**
Instantaneous Reserve	Spinning reserve	$980,078
	Interruptible Load	$979,200
	Constrained On	$3,691
	Total monthly Cost	**$1,962,969**
Over Frequency Reserve	**Total monthly Cost**	**$113,198**
Black Start	**Total monthly Cost**	**$52,487**
Voltage Support	**Total monthly Cost**	**$-**
All Ancillary Services	**Total monthly Cost**	**$2,838,052**

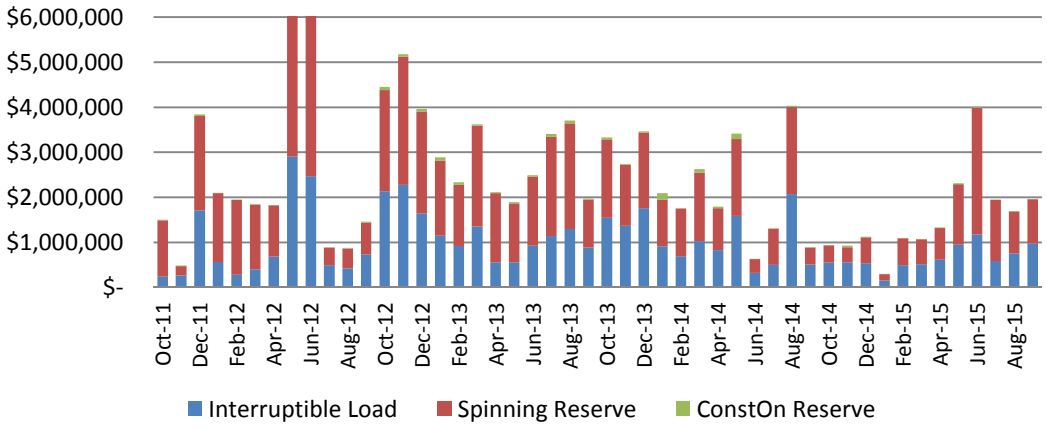
Ancillary Services Costs (past 4 years)



Frequency Keeping (past 4 years)



Instantaneous Reserve (past 4 years)



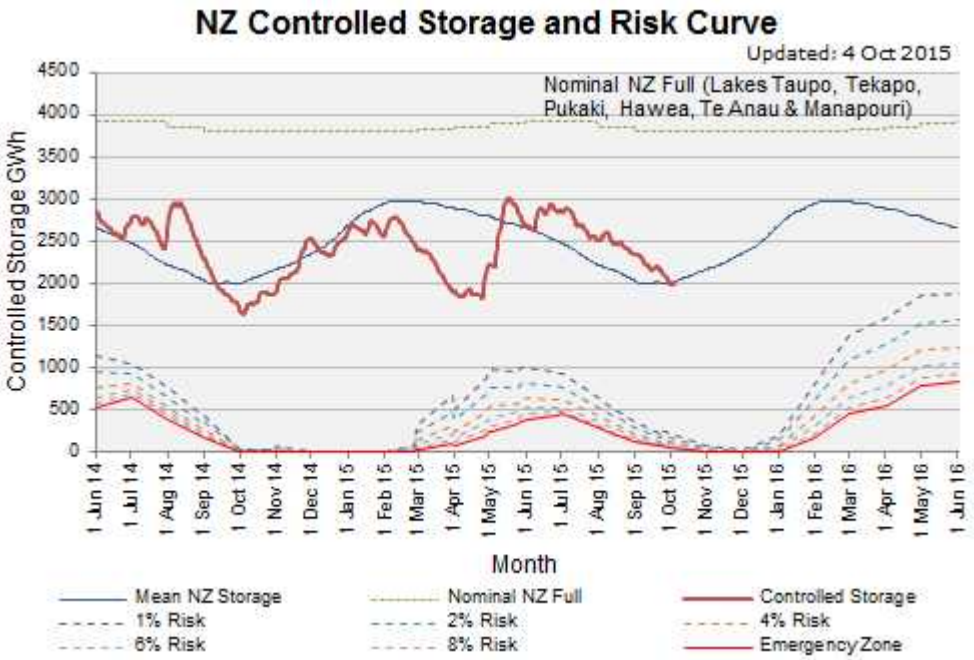
Note: IR Cost May 2012 = 14.129M, IR Cost Jun 2012 = 8.164M

Appendix C – Security of Supply

New Zealand Hydro Storage and Hydro Risk Curves

As at 4 October 2015, aggregate primary New Zealand storage was 100% of average.

The graph below compares New Zealand hydro storage to the hydro risk curves.



Hydro Storage and Generation

North Island inflows during September were 113% of average.

South Island inflows during September were 70% of average.

Measurements are based on daily inflow values.

Hydro generation met 61% of demand during September.

System Performance Report
To the Electricity Authority
September 2015

Purpose

This System Performance Report summarises power system performance each month. The detailed reporting of system events is intended to provide an understanding of the nature of system events that occur in the normal course of the real time co-ordination of security and to identify emerging issues in system operation.

SYSTEM OPERATOR

TRANSPOWER

Keeping the energy flowing

Transpower New Zealand Ltd The National Grid

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1. Summary of System Performance

This system performance report covers the month of September 2015.

Principal Performance Obligations

- The system operator met the Principal Performance Obligations during the reporting period.

System Events

- On 20 September, at 14:11, 110 kV Karapiro – Te Awamutu circuit 1 tripped resulting in a loss of supply to Te Awamutu Substation. Supply was restored after 69 minutes.
- On 29 September, at 07:22, Wiri supply transformer T1 tripped, and was followed approximately 30 seconds later by T2. This resulted in a loss of supply to Wiri substation. Supply was restored after ten minutes.

Other noteworthy events during the reporting period:

- On 7 September, at 11:24, the four generating units at Whakamaru (G1 to G4) tripped during a one minute period.
- On 25 September, at 08:24, a severe feeder fault occurred at Paraparaumu substation. The resultant voltage depression was sufficient to cause a commutation failure on HVDC Pole 2.
- On 30 September a number of HVDC commutation failures were caused by faults on the 220 kV system, as follows:
  - At 11:48 Bunnythorpe – Paraparaumu – Haywards circuit 1 tripped and auto-reclosed resulting in a commutation failure on HVDC Poles 2 & 3;
  - At 15:09 Bunnythorpe – Tokaanu circuit 1 tripped and auto-reclosed resulting in a commutation failure on HVDC Pole 3;
  - At 15:10 Bunnythorpe – Tokaanu circuit 1 tripped, auto-reclosed, and tripped again resulting in commutation failures on HVDC Pole 3. A fire under the circuit was determined to be causing the trippings.

2. Principal Performance Obligations

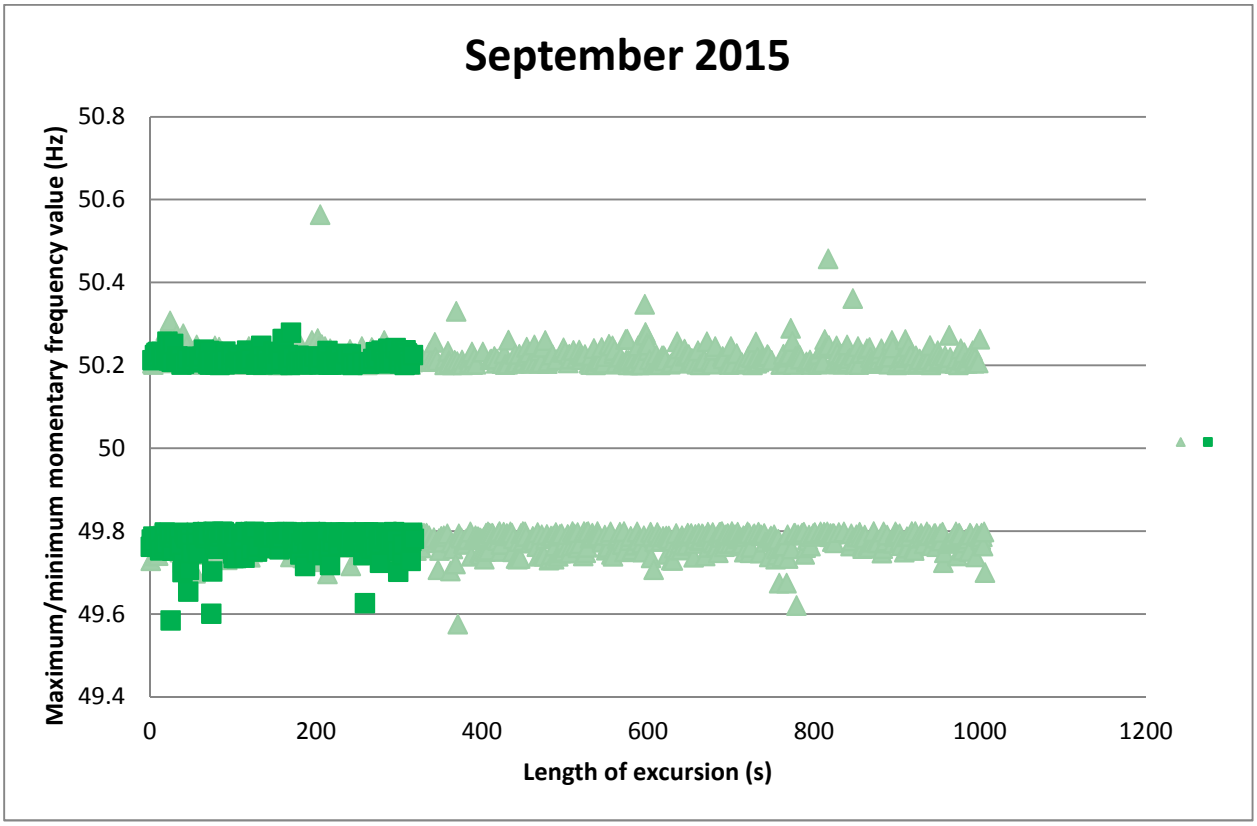
2.1 Avoid Cascade Failure

No instances of cascade failure occurred during the reporting period.

2.2 Frequency

Maintain frequency in normal band and recover quickly from a fluctuation

The chart below shows the maximum or minimum frequency reached and length of each frequency excursion outside the normal band (49.8 to 50.2 Hz) during the reporting period. The majority of excursions were within 0.4 Hz of the normal band and frequency typically returned to within the normal band within 2 minutes.



Maintain Frequency and limit rate occurrences during momentary fluctuations

The table below shows the number of momentary fluctuations outside the frequency normal band, recorded in both Islands, over the last 12 months. The 12 month cumulative totals, grouped by frequency band, are compared to the frequency performance objective (PPO).

Frequency Band	Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Annual rate	PPO target
55.00 > Freq >= 53.75														**0.2***
53.75 > Freq >= 52.00														**2***
52.00 > Freq >= 51.25														**7**
51.25 > Freq >= 50.50		2			1	2	1	1	4	2	2		**15**	**50**
50.50 > Freq >= 50.20	244	360	165	26	25	47	153	252	308	104	131	146	**1961**	
50.20 > Freq > 49.80														
49.80 >= Freq > 49.50	351	375	204	24	15	44	174	315	295	141	170	172	**2280**	
49.50 >= Freq > 48.75	2	5	2	1	1	1					1		**13**	**60**
48.75 >= Freq > 48.00		1											**1**	**6**
48.00 >= Freq > 47.00														**0.2**
47.00 >= Freq > 45.00														**0.2**

***** South Island

Manage time error and eliminate time error once per day

The time error performance criteria are:

- Time error must be managed within +/- 5 seconds.
- Time error must be eliminated at least once every day.

Time Error Compliance Table		Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15
Time Error Management	NI	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	SI	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Error Elimination	NI	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	SI	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

3. Operational Management

3.1 Security Notices

The following table shows the number of Warning Notices, Grid Emergency Notices and Customer Advice Notices issued over the last 12 months.

Notices issued	Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15
Demand Allocation Notice	-	-	-	-	-	-	-	-	-	-	-	-
Grid Emergency Notice	7	3	5	1	4	-	2	3	1	-	-	-
Warning Notice	8	11	23	29	27	31	10	12	-	-	1	-
Customer Advice Notice	28	22	20	11	12	12	13	32	11	5	6	10

3.2 Grid Emergencies

The following table shows grid emergencies declared by the system operator in the reporting period.

Date	**Time**	**Summary Details**	**Island**
		None	

A summary of grid emergencies declared in the last 12 months is shown in the following table:

Island	Region	Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	July-15	Aug-15	Sep-15	Total
North Island	Northland	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Auckland	4	-	-	-	-	-	-	-	-	-	-	-	**4**
	Zone 1	-	-	-	-	-	-	1	-	-	-	-	-	**1**
	Waikato	2	2	4	1	2	-	-	3	-	-	-	-	**14**
	Bay of Plenty	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Hawkes Bay	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Taranaki	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Bunnythorpe	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Wellington	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	North Island (all)	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Lower North Island	-	-	-	-	-	-	-	-	-	-	-	-	**0**
North & South Islands		1	-	-	-	-	-	-	1	-	-	-	-	**2**
South Island & HVDC	Nelson Marlborough	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	West Coast	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Christchurch	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Canterbury	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Zone 3	-	1	-	-	-	-	-	-	-	-	-	-	**1**
	Otago	-	-	-	-	1	-	-	-	-	-	-	-	**1**
	Southland	-	-	-	-	1	-	1	-	1	-	-	-	**3**
	South Island (all)	-	-	1	-	-	-	-	-	-	-	-	-	**1**
	HVDC	-	-	-	-	-	-	-	-	-	-	-	-	**0**

3.3 Customer Advice Notices (CANs)

Ten CANs were issued in the reporting period:

- two related to a failure of schedules to run in the market systems following the change to NZDT on 27 September 2015;
- two advised of temporary disabling of Frequency Keeping Control (FKC) mode on the HVDC due to a market systems outage;
- one advised of a new constraint developed for planned outages in the New Plymouth area on 1 October 2015;
- one advised of new constraints developed for planned 110 kV Hamilton – Karapiro circuit outages;
- one advised of new constraints developed for planned outages in the Halfway Bush area on 19 – 20 September 2015;
- one advised changes to Sustained Instantaneous Reserve (SIR) sharing modelling, deployed as part of the HVDC Tools upgrade, would be effective from 29 September 2015;
- one advised interim Variable Line Rating (iVLR) would be implemented on the Otahuhu – Wiri circuits from 7 October 2015; and
- one related to upper North Island security, post decommissioning of the certain thermal units.

3.4 Standby Residual Check (SRC) notices

A total of 116 SRC notices were issued based on the SDS (the system operator's own load forecasting tool). These SRC notices were in respect of trading periods on 1, 3–4, 7–8, 10, 14, 22, and 28–29 September.

3.5 Voltage Management

Grid voltages did not exceed the Code voltage ranges.

3.6 OUTAGE MANAGEMENT

The following table shows the number of outages over the last 12 months where operational measures (generation agreements, load management agreements or grid re-configurations) were required to allow the outage to proceed. Load agreements generally require the distributor to manage load at one or more grid exit points. Generation agreements are required to ensure sufficient regional generation is available to provide energy or reactive support during the outage to maintain security standards. Grid re-configurations typically involve splitting the network during the outage to manage post contingency power flows. Security of supply is sometimes reduced by grid re-configuration.

Island	Region	Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	July-15	Aug-15	Sep-15	Total
North Island	Northland	5	3	3	3	7	6	12	8	7	-	3	3	**60**
	Auckland	4	3	1	1	6	4	8	11	5	3	7	9	**62**
	Waikato	10	9	3	4	10	9	8	11	7	4	6	9	**90**
	Bay of Plenty	6	7	6	3	4	4	6	4	4	3	2	5	**54**
	Hawkes Bay	5	2	2	2	4	6	6	7	3	-	-	3	**40**
	Taranaki	2	7	-	4	4	3	2	5	2	-	-	2	**31**
	Bunnythorpe	7	4	1	5	4	4	8	7	4	2	2	-	**48**
	Wellington	12	9	10	11	9	8	9	6	7	-	3	4	**88**
Total		51	44	26	33	48	44	59	59	39	12	23	35	**473**
South Island	Nelson Marlborough	10	14	8	7	6	4	6	8	3	2	2	4	**74**
	West Coast	10	11	8	8	8	6	5	10	7	6	3	3	**85**
	Christchurch	7	10	6	5	8	7	7	7	6	6	4	3	**76**
	Canterbury	6	7	4	4	5	2	2	6	1	2	2	3	**44**
	Otago	2	4	2	1	3	2	3	5	-	-	2	2	**26**
	Southland	1	3	3	1	2	4	5	3	1	4	2	1	**30**
Total		36	49	31	26	32	25	28	39	18	20	15	16	**335**

3.7 CONSTRAINTS

SUMMARY: Security constraints binding during the month

The following table shows the binding constraints during the reporting period.

Additional information on security constraints can be found on the following website address: *http://www.systemoperator.co.nz/security-management#cs-147305*.

This information includes constraint equations and a brief summary of their purpose.

Island	Region	Branch	Description	Total
South Island & HVDC	Southland	EDN_INV.1__HWB_TMH.1__HWB_TMH__INV__LN	This is an SFT generated constraint. Its purpose is to protect Edendale-Invercargill 1 for a tripping of Halfway Bush-Three Mile Hill 1.	3
Grand Total				**3**

Constraints binding during last 12 months

The following table shows constraints that bound during the reporting period for a duration of four or more trading periods, and those binding for more than 48 trading periods during the previous 12 months.

Island	Region	Constraint	Reporting period		Previous 12 months	
			Number of trading periods that constraint bound	Percentage of trading periods	Number of trading periods that constraint bound	Percentage of Trading periods
North Island	Hawkes Bay	RDF_T3&T4_S_P_1	0	0.00%	87	0.50%
South Island & HVDC	West Coast	COL_HOR2.1__COL_HOR3.1__COL_HOR3__COL__LN	0	0.00%	68	0.39%
		COL_HOR3.1__COL_HOR2.1__COL_HOR2__COL__LN	0	0.00%	55	0.31%
		HOR_KBY_ISL1.2__HOR_KBY_ISL2.2__:S__HOR_ISL2__ISL__LN	0	0.00%	128	0.73%
	Otago	NSY_ROX.1__CYD_TWZ2.1__CYD_TWZ2__ROX__LN	0	0.00%	103	0.59%

4. System Events

4.1 Significant System Events

The following table shows significant events (frequency excursions and connection point events) which occurred during the reporting period.

Significant frequency excursions

Date	Time	Summary Details	Island	Freq (Hz)
		None.		

Connection point events

Date	Time	Summary Details	Generation / Load interrupted (MW)	Restoration time (minutes)
20/09/15	14:11	110 kV Karapiro – Te Awamutu Circuit 1 tripped resulting in a loss of supply to Te Awamutu.	26	69
29/09/15	07:22	Wiri Supply Transformer T1 tripped during planned switching followed a short time later by T2. This resulted in a loss of supply to Wiri Substation.	62	10

4.2 SYSTEM EVENTS DURING REPORTING PERIOD

A summary of system events during the reporting period is:

Contingent events

Event	Number	Summary
Loss of single AC transmission circuit	8	These related to trippings of: • Arapuni-Bombay 1 • Bunnythorpe-Tokaanu 2 (auto reclose) • Coleridge-Otira 2 (auto reclose) • Islington-Livingstone 1 • Karapiro-Te Awamutu 1 • Otahuhu-Whakamaru 1 (2 x auto reclose) • Otahuhu-Whakamaru 2 (auto reclose)
HVDC Start/Stop	1	This related to: • Commutation failure on HVDC Pole 3 due resulting from a feeder fault that depressed the local voltage.
Supply Transformer	2	This related to: • Wiri T1 & T2
Loss of grid reactive plant	5	These related to trippings of: • Haywards Synchronous Condensers SC3, SC4 • Islington Capacitor Bank C26 • Marsden Static Synchronous Compensator STC6 • Ongarue Capacitor Bank C1
Loss of single generation units	16	These related to trippings of: • Maraetai G6 • Mokai generation • Onepu generation (2 x) • Poihippi G1 • Rangipo G6 • Rotokawa generation (2 x) • Te Mihi G2 • Tokaanu G4 • Tuai G3 • Waipori generation (2 x) • Whakamaru G1 • Whareroa G1 • Wheao generation
Total during reporting period	**32**	

Extended contingent events

Event	Number	Summary
Loss of both HVDC poles	0	
Loss of interconnecting transformer	0	
Loss of bus bar section	0	
Total during reporting period	**0**	

Other events

Event	Number	Summary
Loss of multiple AC transmission circuits	3	These related to: • Bunnythorpe-Tokaanu 2 (1 x auto reclose, 1 x trip), resulting voltage disturbance caused a commutation failures on HVDC P3 • Bunnythorpe-Paraparaumu-Haywards 1 (auto reclose), resulting voltage disturbance caused a commutation failures on HVDC P2 & P3
Demand change	0	
Generation	3	This related to tripping of: • Arapuni generator runback scheme operated • Maraetai G8 & G9 • Whakamaru G2, G3, & G4
Total during reporting period	**6**	

Other disturbances

Event	Number	Summary
Feeder trippings	52	Various locations
Total during reporting period	**52**	

4.3 System Events – Trend

	Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Total	Average Events per month
Contingent Event – transmission	19	9	11	13	10	8	13	8	26	11	7	8	**143**	11.9
Contingent Event – generation	1	16	12	19	10	14	6	11	11	13	6	16	**135**	11.3
Contingent Event – Supply transformer	4	1	1	2	3	2	3	3	4	0	1	2	**26**	2.2
Contingent Event – Reactive plant	1	2	1	7	4	2	3	6	4	3	2	5	**40**	3.3
Contingent Event - HVDC	2	7	0	1	0	3	0	0	0	0	0	1	**14**	1.2
Extended Contingent Event HVDC	0	0	0	0	0	0	0	0	0	0	0	0	**0**	0.0
Extended Contingent Event Inter-connecting Transformers	1	0	0	0	0	1	0	2	0	0	0	0	**4**	0.3
Extended Contingent Event Busbar	2	0	1	0	0	1	2	1	2	0	1	0	**10**	0.8
Other Event – AC transmission	2	3	0	2	1	4	0	1	8	0	0	3	**24**	2.0
Other Event – Demand	1	5	0	1	2	1	1	2	5	2	3	0	**23**	1.9
Other Event – Generation	1	1	0	3	1	4	0	1	0	0	1	3	**15**	1.3